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REPORT
of

THE ARMY AIR FORCES BOARD

ORLANDO, FLORIDA

Parachute Jumping - Comfort - Questionnaire
Project AAF 4225

SUBJECT

"DTIC USERS ONLY"

PARACHUTE QUESTIONNAIRE PROJECT

PROJECT No 4225A373.1

DATE

17 March 1945

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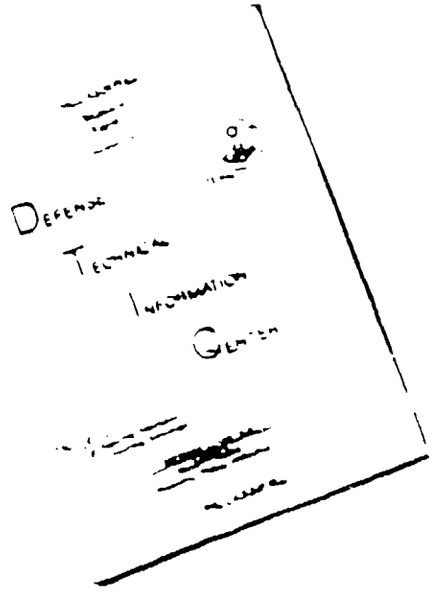

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THE ARMY AIR FORCES BOARD
Orlando, Florida

ARMY AIR FORCES BOARD PROJECT NO. 4225A373.1

PARACHUTE QUESTIONNAIRE PROJECT

17 March 1945

I. OBJECT.

The object of this project is to determine the effectiveness of parachutes and emergency exits with respect to type of aircraft, crew position, personal equipment, and technique of personnel.

II. FACTUAL DATA.

The analysis concerns 1,788 parachute questionnaires, collected by the Air Safety Section of the Directorate of Operations, U. S. Strategic Air Forces in Europe, covering all known combat and non-combat aircraft losses in which crew members were saved by parachute. The bail-outs were made in the ETO from August 1943 through September 1944 from the following types of airplanes: B-17, B-24, B-26, A-20, P-38, P-47, and P-51.

III. CONCLUSIONS.

(a) The location of the escape hatches on all aircraft is satisfactory providing care is taken to reduce obstructions, such as camera mounts, to a minimum.

(b) Injuries were sustained during exit from the aircraft because of the sharp edges around certain of the hatches.

(c) Battle damage is not the only cause of exit failures; often it is the improper maintenance of the emergency release mechanism.

(d) The back type parachute is preferred by the majority of pilots and other crew members whose duties do not require movement about the airplane as the possibility of snagging is greatly reduced; also the back type parachute is more adaptable to the inclusion of the individual life raft than is the seat type.

(e) There is a requirement for a quick release harness.

(f) Improper fitting of the parachute harness increases the opening shock and can cause serious injury.

(g) The high percentage of injuries incurred when landing, shows a decided lack of training in touchdown technique.

(h) The prevalence of ripcord difficulty indicates either incomplete personnel indoctrination or malfunction of equipment.

IV. RECOMMENDATIONS.

(a) Regular procedures should be established for the use of emergency exits by crew members when leaving the aircraft on the ground after routine flights. Such procedure would insure the frequent testing of all emergency exits.

(b) The sharp edges around all hatches should be eliminated. They should be covered with padding or flattened in such a way that personnel will not be cut on exit.

(c) Considering the vulnerability of all hatches to battle damage and other reasons for failure, training must include established alternate exits in addition to the prescribed exits.

(d) Back type parachutes should be made available in sufficient quantities to supply all personnel whose duties do not require movement about the airplane. They should be made available to all pilots now in theaters of operation, secondly to all other rated personnel in theaters of operation and thirdly to all rated personnel in the zone of the interior.

(e) Bombardment units with a requirement for attachable parachutes should have an adequate supply of one type so that each squadron would have uniform equipment.

(f) The operational characteristics of all types of parachute should be explained to using personnel.

(g) Stress should be given to the advisability of delaying the opening of the parachute until decelleration to terminal velocity.

(h) Static lines should be installed in all multi-place aircraft.

(i) Extra parachutes should be made available to all bombardment crews.

(j) Since large spinning aircraft fall approximately 24,000 feet in one minute, and immobilization due to multiple "G" force is a possibility, personnel should be encouraged to make exits with a minimum of delay.

(k) The same emphasis should be placed on parachute jumping in instruction, practice, and synthetic training aids throughout the training and combat units as is placed on ditching.

(l) Further study should be made of all types of parachute to determine the cause of ripcord failure and it should be established whether

the difficulty reported was due to personnel failure or to equipment malfunction.

V. DISCUSSION.

This analysis is concerned only with those parachute jumps which were successful, and after which the participants were able to evade the enemy and return to their units. There is no record of the number of jumpers killed or captured. For a comparative analysis the study made by the Office of the Surgeon, Air Service Command USSTAF would be instructive (see inclosure C). The analysis of the questionnaires may be broken down into three phases namely: (a) Exit from the airplane, (b) Descent, (c) Landing.

a. Exit from the airplane.

(1) B-17

(a) Of 838 jumps recorded 24 instances of exit failure were reported. Of these 24 failures 5 occurred at the nose hatch, 4 in the bomb-bay, 8 at the waist door, and 7 at the tail gunner's escape hatch. In the majority of instances the emergency release mechanism was inoperative and the hatch jammed shut.

(b) 29 men sustained injuries while leaving the airplane. 15 were injured at the nose hatch, 2 in the bomb-bay, 11 at the waist door and 1 at the tail hatch. A comparison between the percentages of exits used and injuries sustained reveals that although only 35.5% of the men used the nose hatch, of those injured, 52% were injured at this hatch. The most common injury consisted of cuts on the hands and face caused by sharp edges around the hatch.

(2) B-24

(a) 12 exit failures were reported by the 522 men leaving the B-24; 3 were malfunctions of the nose wheel door; 9 were failures of the bomb-bay doors.

(b) 22 men were hurt during exit from the airplane, 9 at the nose hatch, 8 at the camera hatch, 3 at the bomb-bay, and 2 at the top hatch. As in the B-17 analysis, the nose hatch exit was the cause of more than a proportionate number of injuries.

(3) B-26

There were no exit failures reported by B-26 crews. 10 men were hurt leaving the airplane; 5 at the waist window, 4 at the nose wheel and 1 in the bomb-bay. Again the nose wheel door proved to be the most dangerous exit. 40% of the injuries occurred there although it was

used by only 9.5% of those jumping.

(4) A-20

Only 30 questionnaires were furnished for this type airplane. No exit failures were reported. It should be noted, however, that, although the pilots upper escape hatch was used in only six instances, injuries resulted from three exits.

(5) P-38

41 pilots were forced to bail out of this type airplane and only 4 suffered any injury during the exit. None of these four were hit by the empennage, but were hurt extricating themselves from the cockpit. The low injury rate is significant because the P-38 proved to be the hardest type aircraft to slow down prior to bailing out. 52.6% of the pilots reported speeds in excess of 250 mph.

(6) P-47

8 pilots were injured leaving this type airplane. 2 were hit by the fuselage, 1 by the wing, and 5 by the tail. Although almost all of the P-38 and P-51 pilots reported using the back-type parachute, 80.3% of the P-47 pilots had seat-type parachutes. The back-type chute would be preferable in the P-47 if risk of snagging in the cockpit is to be minimized. This is substantiated by the statistics in the analysis which show that 70.9% of the P-47 pilots had less than 1 minute to prepare for the jump whereas only 43.6% of the P-51 pilots and 27.3% of the P-38 pilots had so little time. The possibility of delay is increased by the seat-type parachute.

(7) P-51

14 of the 103 men jumping from the P-51 were hurt. Of these 14, 9 were struck by the tail and the remainder were hurt getting out of the cockpit. The injury rate is high when compared to the other type fighters considering that only 20.9% of the P-51 pilots reported speeds in excess of 250 mph. and only 16.2% of the planes were spinning when exit was made.

b. Descent

(1) The parachute descent is the easiest of the three phases, but the questionnaires suggest that a large percentage of those jumping had not been indoctrinated in the proper techniques.

(2) Analyzing jumps from all types of aircraft together, it is revealed that, of 1601 men reporting on the interval in time between leaving the plane and pulling the ripcord, 263 opened their parachutes

less than three seconds after leaving the airplane, 914 opened in less than ten seconds, and 1289 in less than thirty seconds. Jumps from high altitude heavy bombers show an inclination to pull the ripcord too soon after leaving the aircraft. Of 1281 descents from heavy bombers only 290 men waited over thirty seconds before pulling the ripcord. The many advantages of a free fall were not realized by the majority of the heavy bomber crews. Assuming the majority of these crews bailed out at approximately 15,000 feet, the free fall rate of descent would be approximately 200 feet per second. In other words in thirty seconds of free fall only 6000 feet of altitude would be lost. Free fall benefits the jumper in many ways:

(a) He can descend rapidly into altitudes where bail-out equipment is unnecessary.

(b) He decreases the time of exposure to freezing temperatures.

(c) He eliminates the danger of pulling the ripcord too soon.

(d) He minimizes the possibility of strafing by enemy aircraft.

(e) His rate of fall slows down with decreasing altitude due to the increase in the density of the air, and thus the opening shock of the parachute is reduced.

Only a small percentage of those jumping took advantage of these benefits. Proper training and adequate dissemination of information concerning the delayed jump might alleviate this situation.

(3) Severe shock or injury may occur as the result of the opening of the parachute. There are two main causes of this difficulty; (a) loose fitting of harness; (b) improper body position.

(a) Many men do not realize that the harness should be uncomfortably tight when the wearer is standing in the airplane preparatory to jumping. This is true especially of the leg straps which if loose can cause serious injury. If no attempt is made to control the body position or the arms and legs, it is possible that the jumper will be entangled in the risers when the parachute opens.

(b) 1598 men reported on whether or not they had attempted to control their body before pulling the ripcord. Of these 1134 stated no such attempt had been made and only 169 stated they had straightened their legs and put their feet together in the accepted manner. As a result, the opening shock was increased.

(4) In describing the degree of opening shock experienced, 1744 men reported as follows: No shock, 390; slight shock, 795; severe shock, 453; lost consciousness, 62; suffered injury from shock of opening, 44. It is seen that 559 men suffered severe shock or worse. No doubt this situation would have been vastly improved if more care had been given to harness fitting and body position before pulling the ripcord.

(5) 57 men reported difficulty in pulling the ripcord. The majority of this trouble was experienced by users of the chest type chute. When the ripcord failed to release the parachute from the pack it was necessary to pull the silk out by hand. It is quite possible that many men were too frightened or dazed to take such additional action to free the parachute, and thus their reports are not available. Users of the attachable chest type parachute should be made aware of the possibility of ripcord failure.

c. Landing

(1) The landing phase of the parachute jump proved to be the most dangerous. 608 men were injured slightly; 85 reported serious injury and it is probable that the majority of those with serious injury were captured if the jump was made into enemy-occupied territory. One of the most important maneuvers preparatory to landing is to manipulate the risers so that one will be facing the direction of drift when contact is made with the terrain. 1403 men recorded their relation to the drift while landing. Of these 771 were facing the direction of drift, 445 drifted in backwards, and 177 drifted in sidewards. Evidently those men coming in backwards and sidewards had not had enough instruction in the use of the parachute to make appropriate body turns. Thus the risk of injury was greatly increased.

(2) 1551 men reported the degree of shock when landing. 701 reported a severe jolt, 538 said it was moderate, and 312 thought it was easy. There were only 99 landings on hard surface terrain and if proper technique had been employed, it is believed the landing shock reported would not have been so severe. Only 294 men rolled or tumbled after landing, 469 fell forward, and 599 fell backward. Nobody reported using the landing technique which is currently suggested by the Parachute School at Fort Benning; that is, turning the body so that the landing shock will be absorbed by the fleshy part at the side of the leg and thigh. A recent report of the Medical Safety Division, Office of Flying Safety indicates that about 90% of Air Force personnel injured while making parachute jumps incurred these injuries on landing. It further states that 20% of this group sustained fractures of one or more bones and that this fracture rate is over thirty times that at the Parachute School. The Medical Safety Divisions report and the analysis of these questionnaires would indicate a need for more intensive training in landing techniques.

(3) Total injuries reported including those incurred during exit, those incurred when the parachute opened, and those incurred on landing, number 832, even though 1282 men stated they were following a predetermined bail-out procedure and 1374 claimed to have had previous training in the use of parachutes. In this connection it is interesting to note that 419 confessed to be following no set procedure and 351 stated they had had no parachute training whatsoever.

(4) These reports indicate that many pilots and air crew members can be returned to active duty even if forced to bail-out over enemy occupied territory. The possibilities of escape and evasion are, however, greatly reduced if injuries are sustained as a result of the bail-out. . Although caution should be exercised in interpreting conclusions based on relatively few jumps it seems evident that more emphasis should be placed on bail-out procedures in the training of flying personnel.

(5) The origin of the recommendations lies in the accompanying statistics of injuries reported from free fall parachute jumps by personnel of the Strategic Air Force, ETO. (Inclosure No. 2) Eighty percent (80%) of the men reporting indicated that they had had previous training. Twenty percent (20%) stated they had not had such training. This 20% deficit can be appreciably if not totally lessened. And the questions reasonably arise: what was the nature of the training of the 80%? Can it be improved and intensified to reduce the potential rate of injury?

(6) Evaluation of the statistics indicates a significant relative uniformity of the responses within the two larger categories of the problem (exits from multi-place aircraft and exits from single-place aircraft). A specific and intensive training program can and will decrease substantially the rate of injury.

(a) More personnel will be kept on duty status.

(b) Confidence in equipment will be sustained.

(See suggested Training Program, inclosure No. 4)

(7) Responsibility for instruction in the maintenance and use of emergency equipment belongs to the Personnel Equipment Officer, (see inclosure 5). Perhaps the recent authorization for PEO has filled the need shown by these statistics but more emphasis on bail-out during the training phases would decrease the burden on this officer and be to the advantage of the Army Air Forces.

VI. INCLOSURES

a. Copy of Directive (No. 1)

b. Analysis of Questionnaires (No. 2)

c. Surgeon's Report, Headquarters Air Service Command, USSTAF (No. 3)

d. Suggested Training Program (No. 4)

e. Extract AAF Regulation 55-7, 55-7A (No. 5)

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FOR THE ARMY AIR FORCES BOARD:

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President

OFFICIAL:

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Recorder

HEADQUARTERS
UNITED STATES STRATEGIC AIR FORCES
IN
EUROPE

452.161

SECRET
By Authority of
the Commanding
General.

SUBJECT: Parachute Questionnaire Project. 4385

TO: Commanding General, Army Air Forces, Washington 25, D.C.
(Attention: Assistant Chief of Air Staff, Operations, Commitments and Requirements.)

1. During the past five (5) months the Air Safety Section of the Directorate of Operations, US Strategic Air Forces in Europe, has accumulated an extensive file of bail-out questionnaires covering all known combat and non-combat aircraft losses in which crew members were saved by parachute. It is felt that these files represent the most complete record available, which will show the effectiveness of our emergency equipment, installations, and exits in all types of aircraft used at the present time in the European Theater of Operations. As such, they should furnish valuable information to development agencies of both aircraft and emergency equipment, provided these questionnaires are thoroughly analyzed.

2. As can be seen from the attached file, highly trained crew members were returned to active duty by virtue of the effectiveness of present emergency equipment and many more have undoubtedly been saved but taken prisoner. Yet it is apparent that some aircraft types, and certain positions within specific types, are more difficult to abandon than others even under controlled conditions. This can generally be attributed to structural requirements which cannot be modified without affecting materially the performance or the combat effectiveness of the aircraft; however, it is believed that the saving to the government, as evidenced by the number of personnel rescued to date, might warrant greater consideration being given in the design and mock up stage to emergency facilities in future U. S. aircraft.

3. In accordance with the above, it is requested that under the provisions of AAF Regulation No. 20-20, the Army Air Forces Board be furnished the attached questionnaires for analysis as a second priority project. The object of this project would be to determine the effectiveness of emergency equipment with respect to type of aircraft, crew position, personal equipment, and technique of personnel. It is felt that such a study, based on the numerous actual instances in the enclosed files, would be sufficiently comprehensive to be of great value to all Aircraft Development and Requirement Agencies and Personal and Emergency Equipment Agencies in this and other Theaters of Operations. These parachute questionnaires should also prove beneficial to all Training Agencies for the purpose of improving upon, and evaluating

Inclosure 1.

the effectiveness of the emergency techniques now being taught.

FOR THE COMMANDING GENERAL:

/s/ R. S. Barnard
R. S. BARNARD
A.G.D.
Asst. Adj. Gen.

1 Incl:
Parachute Questionnaire File for April 43 to and including Sept. 44.
(Not included)

1st Ind. AFREQ/M

Hq, Army Air Forces, Washington 25, D.C.

4385

To: President, Army Air Forces Board, Orlando, Florida

1. It is desired that the Army Air Forces Board establish a project as requested in basic communication and that the project be given third priority.

2. When the project report is presented, the questionnaires will be held by the Board pending instructions for their disposition.

By Command of General ARNOLD:

/s/ R. O. Perkins
for DONALD WILSON
Brigadier General, U.S. Army
Asst. Chief of Air Staff
Operations, Commitments
& Requirements.

Incl - n/c

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft B-17

1. Number of jumps recorded 838

2. Crew position	Number	Percentage
Officers	341	40.7
Enlisted men	497	59.3
3. Type mission		
Combat	657	80.1
Operational	163	19.9
4. Date of jump		
April - September 1943	11	01.3
October 1943 - March 1944	157	18.7
April - September 1944	670	80.0
5. Place of jump		
England	261	31.1
France	350	41.8
Belgium	109	13.0
Germany	10	01.2
Other	108	12.9
6. Altitude of jump		
Under 500 feet	12	01.5
500 - 2500 feet	85	10.5
2500 - 5000 feet	109	13.5
5000 - 10000 feet	201	24.8
10000 - 20000 feet	280	34.6
Over 20000 feet	122	15.1
7. Approximate outside air temperature		
Below 0°F	158	22.9
0° - 32°F	250	36.2
32°- 50°F	155	22.4
Over 50°F	128	18.5
8. Weight of individual jumping		
Heavy	332	41.4
Medium	450	56.2
Light	19	02.4
9. Height of individual jumping		
Tall	255	37.0
Medium	357	51.8
Short	77	11.2

	Number	Percentage
10. Type parachute used		
Chest	749	89.4
Seat	34	04.1
Back	55	06.5
11. Bail-out oxygen equipment		
Available	398	51.5
Used	5	00.6
Not available	370	47.9
12. Reason for the jump		
Fire	388	43.8
Engine failure	58	06.6
Flak	69	07.8
Fire damage	151	17.0
Pilot order	149	16.8
Other	71	08.0
13. Time to prepare for jump		
Under 1 minute	64	13.3
1 - 2 minutes	96	20.0
2 - 5 minutes	85	17.7
Over 5 minutes	235	49.0
14. Exit used		
Nose	289	34.5
Waist	379	45.2
Bomb-bay	92	11.0
Tail	54	06.4
Other	24	02.9
15. Reason that exit used		
Ordered	15	01.8
Closest	501	59.4
Easiest	276	32.7
Exit failure	35	04.2
Other	16	01.9
16. Exit failure		
Nose	5	20.8
Waist	4	16.7
Bomb-bay	8	83.3
Tail	7	29.2
Other	0	00.0
17. Attitude of aircraft		
Level	497	65.0
Climb	9	01.2
Spin	85	11.1
Dive	102	13.3
Other	72	09.4

	Number	Percentage
18. Speed		
Under 150 mph	232	31.1
150 - 250 mph	480	64.5
Over 250 mph	33	04.4
19. Injury sustained leaving airplane		
Head	8	27.6
Body	1	04.7
Arms	12	40.1
Legs	8	27.6
20. Injured by:		
Nose Hatch	15	52.0
Bomb-bay	2	06.6
Waist door	11	38.0
Tail Hatch	1	03.4
21. Position leaving airplane		
Backwards	11	01.4
Head first	415	51.3
Rolled	163	20.1
Feet first	220	27.2
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds	87	11.1
3 - 10 seconds	283	36.2
10 - 30 seconds	195	24.9
Over 30 seconds	217	27.8
23. Did you attempt to control body?		
No	500	68.2
Movement of legs and arms	159	21.7
Stiffened	74	10.1
24. Difficulty pulling ripcord		
Yes	28	3.4
If "yes" what type chute used	See note	
No	804	96.6
25. Describe opening shock of parachute		
None	185	22.2
Slight	362	43.5
Severe	231	27.7
Unconscious	31	3.7
Injured	24	2.9
26. Did body oscillate after opening chute?		
Yes	667	80.1
No	166	19.9

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	513	59.4
No	298	34.5
Unsuccessful attempt	53	06.1
28. Were you dizzy or nauseated?		
Yes	96	11.6
No	734	88.4
29. Exposed to hazards		
No	626	76.0
Cold	109	13.0
Gunfire	91	11.0
30. Were you facing direction of drift when landing?		
Facing	363	53.1
Backwards	223	32.7
Sideway	97	14.2
31. Velocity of ground wind		
Under 10 mph	306	51.9
10 - 20 mph	224	38.0
Over 20 mph	60	10.1
32. Ground air temperature		
Under freezing	40	6.4
32° - 50°	50	7.9
Over 50°	539	85.7
33. Landing		
Hard	345	45.7
Moderate	258	34.2
Easy	152	20.1
34. Type of drop to ground		
Swinging	229	31.3
Vertical drop	503	68.7
35. Landing attitude		
Fell forward	260	38.5
Fell backward	305	45.2
Rolled	110	16.3
36. Type of terrain		
Water	34	04.2
Field	564	70.2
Woods	154	19.2
Hard surface	51	06.4

	Number	Percentage
37. Injured in landing		
No	518	62.0
Slightly	283	33.8
Seriously	35	04.2
38. Did you attempt any protective maneuvers?		
Yes	260	31.9
No	554	68.1
39. Were you dragged by the wind		
Yes	109	13.2
No	716	86.8
40. Any trouble collapsing canopy or getting out of harness?		
Yes	72	9.0
No	732	91.0
41. Any previous jumps?		
One	61	7.3
More than one	8	1.0
None	763	91.7
42. Were you following a predetermined bailout procedure?		
Yes	622	76.6
No	190	23.4
43. Have you had previous training in the use of parachutes?		
Yes	641	78.5
No	176	21.5
44. Had your parachute been fitted to you by trained personnel?		
Yes	729	92.9
No	56	7.1
45. Parachute inspection prior to jump		
30 days	369	97.4
60 days	7	01.8
Over 60 days	3	00.8

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft B-24

1. Number of jumps recorded 552

2. Crew position	Number	Percentage
Officers	243	44.0
Enlisted men	309	56.0
3. Type mission		
Combat	485	89.6
Operational	56	10.4
4. Date of jump		
April - September 1943	10	01.8
October 1943 - March 1944	37	06.6
April - September 1944	515	91.6
5. Place of jump		
England	243	44.1
France	179	32.5
Belgium	74	13.4
Germany	6	01.1
Other	49	08.9
6. Altitude of jump		
Under 500 feet	12	02.2
500 - 2500 feet	102	18.9
2500 - 5000 feet	86	15.9
5000 - 10000 feet	158	29.3
10000 - 20000 feet	158	29.3
Over 20000 feet	24	04.4
7. Approximate outside air temperature		
Below 0°F.	78	17.5
0° - 32°F	118	26.5
32°- 50°F	42	09.4
Over 50°F	207	46.6
8. Weight of individual jumping		
Heavy	220	41.3
Medium	301	56.6
Light	11	02.1
9. Height of individual jumping		
Tall	186	40.4
Medium	231	50.1
Short	44	09.5

	Number	Percentage
10. Type parachute used		
Chest	429	78.3
Seat	7	01.3
Back	112	20.4
11. Bail-out oxygen equipment		
Available	314	61.8
Breath	31	06.1
Not available	163	32.1
12. Reason for the jump		
Fire	162	25.1
Engine failure	72	11.2
Flak	106	16.4
Fire	178	27.6
Pilot order	90	14.0
Other	37	05.7
13. Time to prepare for jump		
Under 1 minute	44	11.7
1 - 2 minutes	79	21.1
2 - 5 minutes	47	12.5
Over 5 minutes	205	54.7
14. Exit used		
Nose	80	14.8
Waist (Camera hatch)	183	34.0
Bomb-bay	274	50.8
Top hatch	2	00.4
Other	0	00.0
15. Reason that exit used		
Ordered	19	03.5
Closest	233	43.2
Easiest	268	49.8
Exit failure	12	02.2
Other	7	01.3
16. Exit failure		
Nose	3	25.0
Waist	0	00.0
Bomb-bay	9	75.0
Tail	0	00.0
Other	0	00.0
17. Attitude of aircraft		
Level	365	66.5
Climb	11	02.0
Spin	47	08.6
Dive	73	13.3
Other	53	09.6

	Number	Percentage
18. Speed		
Under 150 mph	108	21.4
150 - 250 mph	384	76.0
Over 250 mph	13	02.6
19. Injury sustained leaving airplane		
Head	7	31.5
Body	3	13.7
Arms	6	27.4
Legs	6	27.4
20. Injured by:		
Nose hatch	9	40.9
Bomb-bay	3	13.6
Camera hatch	8	36.4
Top hatch	2	09.1
21. Position leaving airplane		
Backwards	13	02.4
Head first	186	34.7
Rolled	90	16.8
Feet first	247	46.1
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds	104	20.8
3 - 10 seconds	208	41.7
10 - 30 seconds	114	22.9
Over 30 seconds	73	14.6
23. Did you attempt to control body?		
No	346	69.5
Movement of legs and arms	95	19.1
Stiffened	57	11.4
24. Difficulty pulling ripcord		
Yes	16	02.9
If "yes" what type chute used	See note	
No	531	97.1
25. Describe opening shock of parachute		
No	126	23.3
Slight	259	47.9
Severe	126	23.3
Unconscious	20	03.7
Injured	10	01.8

	Number	Percentage
26. Did body oscillate after opening chute?		
Yes	407	76.2
No	127	23.8
27. Any attempt to steer after opening?		
Yes	332	58.7
No	201	35.5
Unsuccessful attempt	33	05.8
28. Were you dizzy or nauseated?		
Yes	75	13.9
No	466	86.1
29. Exposed to hazards		
No	445	82.2
Cold	41	07.6
Gunfire	55	10.2
30. Were you facing direction of drift when landing?		
Facing	247	55.3
Backwards	158	35.3
Sideway	42	09.4
31. Velocity of ground wind		
Under 10 mph	207	54.2
10 - 20 mph	121	31.7
Over 20 mph	54	14.1
32. Ground air temperature		
Under freezing	1	00.3
32° - 50°	35	08.5
Over 50°	374	91.2
33. Landing		
Hard	212	44.3
Moderate	180	37.7
Easy	86	18.0
34. Type of drop to ground		
Swinging	119	25.6
Vertical drop	346	74.4
35. Landing attitude		
Fell forward	131	31.3
Fell backward	191	45.6
Rolled	97	23.1

	Number	Percentage
36. Type of terrain		
Water	14	02.7
Field	415	79.2
Woods	70	13.3
Hard surface	25	4.8
37. Injured in landing		
No.	298	56.4
Slightly	199	37.7
Seriously	31	05.9
38. Did you attempt any protective maneuvers?		
Yes	219	41.2
No	313	58.8
39. Were you dragged by the wind		
Yes	44	08.3
No	488	91.7
40. Any trouble collapsing canopy or getting out of harness?		
Yes	27	05.0
No	510	95.0
41. Any previous jumps?		
One	18	03.3
More than one	2	00.4
None.	525	96.3
42. Were you following a predetermined bail-out procedure?		
Yes	407	77.5
No	118	22.5
43. Have you had previous training in the use of parachutes?		
Yes	429	80.8
No	102	19.2
44. Had your parachute been fitted to you by trained personnel?		
Yes	419	83.6
No	82	16.4
45. Parachute inspection prior to jump		
30 days	194	96.5
60 days	4	02.0
Over 60 days	3	01.5

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft B-26

1. Number of jumps recorded 148

2. Crew position	Number	Percentage
Officers	76	51.4
Enlisted men	72	48.6
3. Type mission		
Combat	139	93.9
Operational	9	06.1
4. Date of jump		
April - September 1943	0	00.0
October 1943 - March 1944	10	06.8
April - September 1944	138	93.2
5. Place of jump		
England	40	27.0
France	99	66.9
Belgium	3	02.0
Germany	0	00.0
Other	6	04.1
6. Altitude of jump		
Under 500 feet	6	04.1
500 - 2500 feet	19	12.9
2500 - 5000 feet	23	15.6
5000 - 10000 feet	80	54.5
10000 - 20000 feet	19	12.4
Over 20000 feet	0	00.0
7. Approximate outside air temperature		
Below 0°F	11	08.9
0° - 32°F	35	28.2
32° - 50°F	13	10.5
Over 50°F	65	52.4
8. Weight of individual jumping		
Heavy	58	41.4
Medium	82	58.6
Light	0	00.0
9. Height of individual jumping		
Tall	37	32.2
Medium	65	56.5
Short	13	11.3

	Number	Percentage
10. Type parachute used		
Chest	114	77.0
Seat	1	00.7
Back	33	22.3
11. Bail-out oxygen equipment		
Available	2	02.0
Used	0	00.0
Not available	99	98.0
12. Reason for the jump		
Fire	29	17.5
Engine failure	8	04.8
Flak	81	48.7
Fire damage	23	13.9
Pilot order	23	13.9
Other	2	01.2
13. Time to prepare for jump		
Under 1 minute	32	23.9
1 - 2 minutes	17	12.7
2 - 5 minutes	22	16.4
Over 5 minutes	63	47.0
14. Exit used		
Nose	14	09.5
Waist	70	47.3
Bomb-bay	60	40.5
Tail	0	00.0
Other	4	02.7
15. Reason that exit used		
Ordered	1	00.7
Closest	81	55.4
Easiest	62	42.5
Exit failure	0	00.0
Other	2	01.4
16. Exit failure		
Nose	0	00.0
Waist	0	00.0
Bomb-bay	0	00.0
Tail	0	00.0
Other	0	00.0
17. Attitude of aircraft		
Level	80	54.1
Climb	0	00.0
Spin	8	05.4
Dive	33	22.3
Other	27	18.2

	Number	Percentage
18. Speed		
Under 150 mph.	17	13.1
150 - 250 mph.	104	80.0
Over 250 mph	9	06.9
19. Injury sustained leaving airplane		
Head	0	00.0
Body	8	80.0
Arms	1	10.0
Legs	1	10.0
20. Injured by:		
Waist window	5	50.0
Nose wheel.	4	40.0
Bomb-bay.	1	10.0
Other.	0	00.0
21. Position leaving airplane		
Backwards.	2	01.4
Head first	63	44.4
Rolled	23	16.2
Feet first	54	38.0
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds.	11	08.2
3 - 10 seconds	63	52.9
10 - 30 seconds.	36	30.3
Over 30 seconds.	9	07.8
23. Did you attempt to control body?		
No.	104	77.0
Movement of legs and arms	18	13.3
Stiffened	13	09.7
24. Difficulty pulling ripcord		
Yes.	5	03.4
If "yes" what type chute used.	See note	
No	142	96.6
25. Describe opening shock of parachute		
None	33	22.3
Slight	57	38.5
Severe	51	34.5
Unconscious.	2	01.3
Injured.	5	03.4
26. Did body oscillate after opening chute?		
Yes.	108	75.5
No	35	24.5

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	86	56.9
No	57	37.8
Unsuccessful attempt	8	05.3
28. Were you dizzy or nauseated?		
Yes	23	17.5
No	108	82.5
29. Exposed to hazards		
No	106	75.7
Cold	10	07.2
Gunfire	24	17.1
30. Were you facing direction of drift when landing?		
Facing	52	51.0
Backwards	38	37.2
Sideway	12	11.8
31. Velocity of ground wind		
Under 10 mph	61	63.0
10 - 20 mph	24	24.7
Over 20 mph	12	12.3
32. Ground air temperature		
Under freezing	4	03.9
32° - 50°	5	04.9
Over 50°	93	91.2
33. Landing		
Hard	60	53.6
Moderate	36	32.1
Easy	16	14.3
34. Type of drop to ground		
Swinging	36	29.8
Vertical drop	85	70.2
35. Landing attitude		
Fell forward	30	28.8
Fell backward	42	40.4
Rolled	32	30.8
36. Type of terrain		
Water	4	03.0
Field	101	74.8
Woods	19	14.1
Hard surface	11	08.1

		Number	Percentage
37.	Injured in landing		
	No	80	59.2
	Slightly	53	39.3
	Seriously	2	01.5
38.	Did you attempt any protective maneuvers?		
	Yes	54	39.4
	No	83	60.6
39.	Were you dragged by the wind		
	Yes	12	08.3
	No	132	91.7
40.	Any trouble collapsing canopy or getting out of harness?		
	Yes	2	01.4
	No	136	98.6
41.	Any previous jumps?		
	One	11	07.9
	More than one	2	01.4
	None	126	90.7
42.	Were you following a predetermined bail-out procedure?		
	Yes	93	72.1
	No	36	27.9
43.	Have you had previous training in the use of parachutes?		
	Yes	107	78.1
	No	30	21.9
44.	Had your parachute been fitted to you by trained personnel?		
	Yes	116	92.8
	No	9	07.2
45.	Parachute inspection prior to jump		
	30 days	60	93.7
	60 days	4	06.3
	Over 60 days	0	00.0

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft A-20

1. Number of jumps recorded 30

2. Crew position	Number	Percentage
Officers	8	26.7
Enlisted men	22	73.3
3. Type mission		
Combat	30	100.0
Operational	0	00.0
4. Date of jump		
April - September 1943	0	00.0
October 1943 - March 1944	0	00.0
April - September 1944	30	100.0
5. Place of jump		
England	11	36.7
France	19	63.3
Belgium	0	00.0
Germany	0	00.0
6. Altitude of jump		
Under 500 feet	0	00.0
500 - 2500 feet	11	37.9
2500 - 5000 feet	5	17.2
5000 - 10000 feet	3	10.4
10000 - 20000 feet	10	34.5
Over 20000 feet	0	00.0
7. Approximate outside air temperature		
Below 0°F	1	05.3
0° - 32°F	1	05.3
32°- 50°F	3	15.7
Over 50°F	14	73.7
8. Weight of individual jumping		
Heavy	14	48.3
Medium	15	51.7
Light	0	00.0
9. Height of individual jumping		
Tall	8	32.0
Medium	14	56.0
Short	3	12.0

	Number	Percentage
10. Type parachute used		
Chest	12	40.0
Seat	1	03.0
Back	17	56.7
11. Bail-out oxygen equipment		
Available	0	00.0
Used	0	00.0
Not available	22	100.0
12. Reason for the jump		
Fire	8	26.7
Engine failure	1	03.3
Flak	4	13.3
Fire damage	2	06.7
Pilot order	8	26.7
Other	7	23.3
13. Time to prepare for jump		
Under 1 minute	5	26.3
1 - 2 minutes	2	10.5
2 - 5 minutes	1	5.3
Over 5 minutes	11	57.9
14. Exit used		
Pilots top	6	20.0
Tunnel hatch	12	40.0
Waist	12	40.0
Tail	0	00.0
Other	0	00.0
15. Reason that exit used		
Ordered	0	00.0
Closest	0	00.0
Easiest	30	100.0
Exit failure	0	00.0
Other	0	00.0
16. Exit failure		
Nose	0	00.0
Waist	0	00.0
Bomb-bay	0	00.0
Tail	0	00.0
Other	0	00.0
17. Attitude of aircraft		
Level	17	56.6
Climb	0	00.0
Spin	5	16.7
Dive	6	20.0
Other	2	06.7

	Number	Percentage
18. Speed		
Under 150 mph	4	16.0
150 - 250 mph	18	72.0
Over 250 mph	3	12.0
19. Injury sustained leaving airplane		
Head	1	25.0
Body	3	75.0
Arms	0	00.0
Legs	0	00.0
20. Injured by:		
Top hatch	3	75.0
Tunnel hatch	1	25.0
Tail	0	00.0
Other	0	00.0
21. Position leaving airplane		
Backwards	0	00.0
Head first	14	48.3
Rolled	2	6.9
Feet first	13	44.8
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds	5	20.8
3 - 10 seconds	12	50.0
10 - 30 seconds	4	16.7
Over 30 seconds	3	12.5
23. Did you attempt to control body?		
No	26	86.6
Movement of legs and arms	2	6.7
Stiffened	2	6.7
24. Difficulty pulling ripcord		
Yes	0	00.0
If "yes" what type chute used	0	00.0
No	30	100.0
25. Describe opening shock of parachute		
None	4	13.8
Slight	9	31.0
Severe	12	41.4
Unconscious	4	13.8
Injured	0	00.0
26. Did body oscillate after opening chute?		
Yes	15	51.7
No	14	48.3

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	8	25.8
No	21	67.7
Unsuccessful attempt	2	06.5
28. Were you dizzy or nauseated?		
Yes	4	13.8
No	25	86.2
29. Exposed to hazards		
No	15	51.8
Cold	9	31.0
Gunfire	5	17.2
30. Were you facing direction of drift when landing?		
Facing	16	64.0
Backwards	4	16.0
Sideway	5	20.0
31. Velocity of ground wind		
Under 10 mph	17	80.9
10 - 20 mph	3	14.3
Over 20 mph	1	04.8
32. Ground air temperature		
Under freezing	0	00.0
32° - 50°	0	00.0
Over 50°	21	100.0
33. Landing		
Hard	9	34.6
Moderate	8	30.8
Easy	9	34.6
34. Type of drop to ground		
Swinging	4	16.7
Vertical drop	20	83.3
35. Landing attitude		
Fell forward	7	43.7
Fell backward	5	31.3
Rolled	4	25.0
36. Type of terrain		
Water	6	20.7
Field	17	58.6
Woods	5	17.2
Hard surface	1	03.5

	Number	Percentage
37. Injured in landing		
No	20	66.7
Slightly	9	30.0
Seriously	1	03.3
38. Did you attempt any protective maneuvers?		
Yes	5	16.7
No	25	83.3
39. Were you dragged by the wind		
Yes	1	03.3
No	29	96.7
40. Any trouble collapsing canopy or getting out of harness?		
Yes	4	13.3
No	26	86.7
41. Any previous jumps?		
One	2	06.7
More than one	0	00.0
None	28	93.3
42. Were you following a predetermined bailout procedure?		
Yes	25	83.3
No	5	16.7
43. Have you had previous training in the use of parachutes?		
Yes	21	70.0
No	9	30.0
44. Had your parachute been fitted to you by trained personnel?		
Yes	26	92.9
No	2	07.1
45. Parachute inspection prior to jump		
30 days	15	100.0
60 days	0	00.0
Over 50 days	0	00.0

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft P-38

1. Number of jumps recorded 41

2. Crew position	Number	Percentage
Officers	41	100.0
Enlisted men	0	00.0
3. Type mission		
Combat	41	100.0
Operational	0	00.0
4. Date of jump		
April - September 1943	0	00.0
October 1943 - March 1944	0	00.0
April - September 1944	41	100.0
5. Place of jump		
England	4	09.8
France	34	82.9
Belgium	2	04.9
Germany	0	00.0
Other	1	02.4
6. Altitude of jump		
Under 500 feet	0	00.0
500 - 2500 feet	18	45.0
2500 - 5000 feet	10	25.0
5000 - 10000 feet	5	12.5
10000 - 20000 feet	7	17.5
Over 20000 feet	0	00.0
7. Approximate outside air temperature		
Below 0°F	1	02.8
0° - 32°F	1	02.8
32° - 50°F	2	05.8
Over 50°F	31	88.6
8. Weight of individual jumping		
Heavy	23	56.1
Medium	18	43.9
Light	0	00.0
9. Height of individual jumping		
Tall	10	28.6
Medium	23	65.7
Short	2	05.7

	Number	Percentage
10. Type parachute used		
Chest	0	00.0
Seat	0	00.0
Back	41	100.0
11. Bail-out oxygen equipment		
Available	3	08.1
Used	0	00.0
Not available	34	91.9
12. Reason for the jump		
Fire	29	63.0
Engine failure	2	04.4
Flak	4	08.7
Fire damage	6	13.0
Mid-air collision	5	10.9
Other	0	00.0
13. Time to prepare for jump		
Under 1 minute	3	27.3
1 - 2 minutes	4	36.4
2 - 5 minutes	3	27.3
Over 5 minutes	1	09.0
14. Exit used		
Right side	4	10.0
Left side	15	37.5
Canopy	21	52.5
Tail	0	00.0
Other	0	00.0
15. Reason that exit used		
Ordered		
Closest		
Easiest	40	100.0
Exit failure		
Other		
16. Exit failure		
Nose		
Waist		
Bomb-bay		
Tail		
Other		
17. Attitude of aircraft		
Level	10	25.6
Climb	3	07.7
Spin	4	10.3
Dive	12	30.8
Other	2	05.1
Inverted	8	20.5

	Number	Percentage
18. Speed		
Under 150 mph	7	18.4
150 - 250 mph	11	29.0
Over 250 mph	20	52.6
19. Injury sustained leaving airplane		
Head	0	00.0
Body	1	25.0
Arms	0	00.0
Legs	3	75.0
20. Injured by:		
Wings	0	00.0
Fuselage	4	100.0
Tail	0	00.0
Other	0	00.0
21. Position leaving airplane		
Backwards	0	00.0
Head first	31	83.8
Rolled	3	8.1
Feet first	3	8.1
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds	12	37.5
3 - 10 seconds	14	43.7
10 - 30 seconds	3	9.4
Over 30 seconds	3	9.4
23. Did you attempt to control body?		
No	27	71.0
Movement of legs and arms	3	7.9
Stiffened	8	21.1
24. Difficulty pulling ripcord		
Yes	2	05.0
If "yes" what type chute used	See note	
No	36	95.0
25. Describe opening shock of parachute		
None	7	20.0
Slight	21	60.0
Severe	7	20.0
Unconscious	0	00.0
Injured	0	00.0
26. Did body oscillate after opening chute?		
Yes	22	57.9
No	16	42.1

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	21	55.3
No	17	44.7
Unsuccessful attempt	0	00.0
28. Were you dizzy or nauseated?		
Yes	2	05.3
No	36	94.7
29. Exposed to hazards		
No	25	67.6
Cold	0	00.0
Gunfire	12	32.4
30. Were you facing direction of drift when landing?		
Facing	10	52.6
Backwards	8	42.1
Sideway	1	05.3
31. Velocity of ground wind		
Under 10 mph	14	53.8
10 - 20 mph	9	34.6
Over 20 mph	3	11.6
32. Ground air temperature		
Under freezing	0	00.0
32° - 50°	0	00.0
Over 50°	33	100.0
33. Landing		
Hard	20	69.0
Moderate	4	13.8
Easy	5	17.2
34. Type of drop to ground		
Swinging	9	29.0
Vertical drop	22	71.0
35. Landing attitude		
Fell forward	7	26.9
Fell backward	11	42.3
Rolled	8	30.8
36. Type of terrain		
Water	0	00.0
Field	24	64.9
Woods	11	29.7
Hard surface	2	05.4

		Number	Percentage
37.	Injured in landing		
	No	15	39.5
	Slightly	18	47.4
	Seriously	5	13.1
38.	Did you attempt any protective maneuvers?		
	Yes	13	35.1
	No	24	64.9
39.	Were you dragged by the wind		
	Yes	4	10.3
	No	35	89.7
40.	Any trouble collapsing canopy or getting out of harness?		
	Yes	2	05.1
	No	37	94.9
41.	Any previous jumps?		
	One	0	00.0
	More than one	0	00.0
	None	39	100
42.	Were you following a predetermined bail-out procedure?		
	Yes	22	57.9
	No	16	42.1
43.	Have you had previous training in the use of parachutes?		
	Yes	31	81.6
	No	7	18.4
44.	Had your parachute been fitted to you by trained personnel?		
	Yes	39	100
	No	0	00.0
45.	Parachute inspection prior to jump		
	30 days	18	100
	60 days	0	00.0
	Over 60 days	0	00.0

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft P-47

1. Number of jumps recorded 76

2. Crew position	Number	Percentage
Officers	76	100
Enlisted men	0	00.0
3. Type mission		
Combat	76	100
Operational	0	00.0
4. Date of jump		
April - September 1943		
October 1943 - March 1944		
April - September 1944		
5. Place of jump		
England	14	18.4
France	53	69.7
Belgium	4	05.3
Germany	0	00.0
Other	5	06.6
6. Altitude of jump		
Under 500 feet	2	02.7
500 - 2500 feet	35	48.0
2500 - 5000 feet	16	21.9
5000 - 10000 feet	13	17.8
10000 - 20000 feet	6	08.2
Over 20000 feet	1	01.4
7. Approximate outside air temperature		
Below 0°F	0	00.0
0° - 32°F	0	00.0
32° - 50°F	6	11.5
Over 50°F	46	88.5
8. Weight of individual jumping		
Heavy	42	57.5
Medium	28	38.4
Light	3	04.1
9. Height of individual jumping		
Tall	17	27.0
Medium	41	65.1
Short	5	07.9

	Number	Percentage
10. Type parachute used		
Chest	0	00.0
Seat	61	80.3
Back	15	19.7
11. Bail-out oxygen equipment		
Available	1	01.4
Used	0	00.0
Not available	69	98.6
12. Reason for the jump		
Fire	23	28.4
Engine failure	12	14.8
Flak	15	18.5
Fire damage	14	17.3
Pilot order	0	00.0
Other	17	21.0
13. Time to prepare for jump		
Under 1 minute	17	70.9
1 - 2 minutes	3	12.5
2 - 5 minutes	2	08.3
Over 5 minutes	2	08.3
14. Exit used		
Right side	26	36.1
Left side	15	20.8
Canopy	31	43.1
Tail		
Other		
15. Reason that exit used		
Ordered		
Closest		
Easiest		
Exit failure		
Other		
16. Exit failure		
Nose		
Waist		
Bomb-bay		
Tail		
Other		
17. Attitude of aircraft		
Level	21	28.0
Climb	6	8.0
Spin	12	16.0
Dive	12	16.0
Other	7	9.3
Inverted	17	22.7

		Number	Percentage
18.	Speed		
	Under 150 mph.	9	13.6
	150 - 250 mph.	42	63.7
	Over 250 mph	15	22.7
19.	Injury sustained leaving airplane		
	Head	0	00.0
	Body	0	00.0
	Arms	3	37.5
	Legs	5	62.5
20.	Injured by:		
	Wings.	1	12.5
	Fuselage	2	25.0
	Tail	5	62.5
	Other.	0	00.0
21.	Position leaving airplane		
	Backwards.	3	04.2
	Head first	64	90.2
	Rolled	1	01.4
	Feet first	3	04.2
22.	Approximate interval between leaving plane and pulling ripcord		
	Under 3 seconds.	15	26.8
	3 - 10 seconds	29	51.8
	10 - 30 seconds.	9	16.1
	Over 30 seconds.	3	05.3
23.	Did you attempt to control body?		
	No.	58	82.9
	Movement of legs and arms	8	11.4
	Stiffened	4	05.7
24.	Difficulty pulling ripcord		
	Yes.	2	02.7
	If "yes" what type chute used.	See note	
	No	71	97.3
25.	Describe opening shock of parachute		
	None	11	17.5
	Slight	37	58.7
	Severe	10	15.9
	Unconscious.	1	01.6
	Injured.	4	06.3
26.	Did body oscillate after opening chute?		
	Yes.	40	57.1
	No	30	42.9

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	43	58.9
No	25	34.2
Unsuccessful attempt	5	06.9
28. Were you dizzy or nauseated?		
Yes	6	08.2
No	67	91.8
29. Exposed to hazards		
No	55	77.5
Cold	4	05.6
Gunfire	12	16.9
30. Were you facing direction of drift when landing?		
Facing	37	71.1
Backwards	8	15.4
Sideway	7	13.5
31. Velocity of ground wind		
Under 10 mph	42	73.7
10 - 20 mph	10	17.5
Over 20 mph	5	08.8
32. Ground air temperature		
Under freezing	1	01.9
32° - 50°	1	01.9
Over 50°	51	96.2
33. Landing		
Hard	18	29.5
Moderate	23	37.7
Easy	20	32.8
34. Type of drop to ground		
Swinging	14	23.7
Vertical drop	45	76.3
35. Landing attitude		
Fell forward	18	34.6
Fell backward	16	30.8
Rolled	18	34.6
36. Type of terrain		
Water	3	04.4
Field	44	64.7
Woods	18	26.5
Hard surface	3	04.4

	Number	Percentage
37. Injured in landing		
No	45	63.4
Slightly	19	26.7
Seriously	7	09.9
38. Did you attempt any protective maneuvers?		
Yes	20	29.4
No	48	70.6
39. Were you dragged by the wind		
Yes	5	06.8
No	68	93.2
40. Any trouble collapsing canopy or getting out of harness?		
Yes	3	04.1
No	70	95.9
41. Any previous jumps?		
One	6	08.2
More than one	0	00.0
None	67	91.8
42. Were you following a predetermined bail-out procedure?		
Yes	43	61.4
No	27	38.6
43. Have you had previous training in the use of parachutes?		
Yes	60	83.3
No	12	16.7
44. Had your parachute been fitted to you by trained personnel?		
Yes	67	95.7
No	3	04.3
45. Parachute inspection prior to jump		
30 days	33	97.1
60 days	1	02.9
Over 60 days	0	00.0

ANALYSIS OF PARACHUTE QUESTIONNAIRE

A. Type Aircraft P-51

1. Number of jumps recorded 103

2. Crew position	Number	Percentage
Officers	103	100
Enlisted men		
3. Type mission		
Combat	103	100
Operational		
4. Date of jump		
April - September 1943		
October 1943 - March 1944		
April - September 1944		
5. Place of jump		
England	33	32.4
France	59	57.9
Belgium	3	02.9
Germany	3	02.9
Other	4	03.9
6. Altitude of jump		
Under 500 feet	7	06.9
500 - 2500 feet	44	43.6
2500 - 5000 feet	20	19.7
5000 - 10000 feet	15	14.9
10000 - 20000 feet	15	14.9
Over 20000 feet	0	00.0
7. Approximate outside air temperature		
Below 0°F	3	03.9
0° - 32°F	7	09.1
32° - 50°F	11	14.3
Over 50°F	56	72.7
8. Weight of individual jumping		
Heavy	57	58.8
Medium	37	38.1
Light	3	03.1
9. Height of individual jumping		
Tall	21	24.7
Medium	55	64.7
Short	9	10.6

	Number	Percentage
10. Type parachute used		
Chest	0	00.0
Seat	4	04.4
Back	88	95.6
11. Bail-out oxygen equipment		
Available	0	00.0
Used	0	00.0
Not available	96	100
12. Reason for the jump		
Fire	28	25.0
Engine failure	20	17.9
Flak	16	14.3
Fire damage	12	10.7
Pilot order	0	00.0
Other	36	32.1
13. Time to prepare for jump		
Under 1 minute	17	43.6
1 - 2 minutes	6	15.4
2 - 5 minutes	7	17.9
Over 5 minutes	9	23.1
14. Exit used		
Right side	16	16.0
Left side	34	34.0
Canopy	50	50.0
15. Reason that exit used		
Ordered		
Closest		
Easiest		
Exit failure		
Other		
16. Exit failure		
Nose		
Waist		
Bomb-bay		
Tail		
Other		
17. Attitude of aircraft		
Level	25	25.2
Climb	3	03.0
Spin	16	16.2
Dive	18	18.2
Other	10	10.1
Inverted	27	27.3

	Number	Percentage
18. Speed		
Under 150 mph	23	25.3
150 - 250 mph	49	53.8
Over 250 mph	19	20.9
19. Injury sustained leaving airplane		
Head	0	00.0
Body	4	28.6
Arms	5	35.7
Legs	5	35.7
20. Injured by:		
Wings	0	00.0
Fuselage	5	35.7
Tail	9	64.3
Other	0	00.0
21. Position leaving airplane		
Backwards	1	01.1
Head first	81	88.0
Rolled	6	06.5
Feet first	4	04.4
22. Approximate interval between leaving plane and pulling ripcord		
Under 3 seconds	29	32.6
3 - 10 seconds	42	47.2
10 - 30 seconds	14	15.7
Over 30 seconds	4	04.5
23. Did you attempt to control body?		
No	73	77.7
Movement of legs and arms	10	10.6
Stiffened	11	11.7
24. Difficulty pulling ripcord		
Yes	4	04.0
If "yes" what type chute used	See note	
No	97	96.0
25. Describe opening shock of parachute		
None	24	25.3
Slight	50	52.6
Severe	16	16.8
Unconscious	4	04.2
Injured	1	01.1
26. Did body oscillate after opening chute?		
Yes	51	61.4
No	32	38.6

	Number	Percentage
27. Any attempt to steer after opening?		
Yes	47	47.5
No	47	47.5
Unsuccessful attempt	5	05.0
28. Were you dizzy or nauseated?		
Yes	11	10.9
No	90	89.1
29. Exposed to hazards		
No	84	84.0
Cold	8	08.0
Gunfire	8	08.0
30. Were you facing direction of drift when landing?		
Facing	46	61.4
Backwards	16	21.3
Sideway	13	17.3
31. Velocity of ground wind		
Under 10 mph	48	55.2
10 - 20 mph	32	36.8
Over 20 mph	7	08.0
32. Ground air temperature		
Under freezing	0	00.0
32° - 50°	3	03.5
Over 50°	82	96.5
33. Landing		
Hard	37	41.1
Moderate	29	32.2
Easy	24	26.7
34. Type of drop to ground		
Swinging	22	23.4
Vertical drop	72	76.6
35. Landing attitude		
Fell forward	16	22.9
Fell backward	29	41.4
Rolled	25	35.7
36. Type of terrain		
Water	28	28.0
Field	48	48.0
Woods	18	18.0
Hard surface	6	06.0

		Number	Percentage
37.	Injured in landing		
	No	65	67.7
	Slightly	27	28.1
	Seriously	4	04.2
38.	Did you attempt any protective maneuvers?		
	Yes	37	37.8
	No	61	62.2
39.	Were you dragged by the wind		
	Yes	5	05.1
	No	94	94.9
40.	Any trouble collapsing canopy or getting out of harness?		
	Yes	2	02.0
	No	98	98.0
41.	Any previous jumps?		
	One	11	10.9
	More than one	0	00.0
	None	90	89.1
42.	Were you following a predetermined bail-out procedure?		
	Yes	70	72.2
	No	27	27.8
43.	Have you had previous training in the use of parachutes?		
	Yes	85	85.0
	No	15	15.0
44.	Had your parachute been fitted to you by trained personnel?		
	Yes	98	100
	No	0	00.0
45.	Parachute inspection prior to jump		
	30 days	57	100
	60 days	0	00.0
	Over 60 days	0	00.0

NOTE ON DIFFICULTY EXPERIENCED PULLING RIPCORD NO. 24

1. Of the 28 difficulties experienced by B-17 personnel, 22 occurred with chest type parachutes, 1 with seat type, and 5 with back type.

2. Of the 16 difficulties experienced by B-24 personnel, 11 occurred with chest type, none with seat type, and 4 with back type.

3. Of the 5 difficulties experienced by B-26 personnel, 3 were with chest type and 2 with back type.

4. Both P-38 pilots who experienced difficulty were wearing back type parachutes.

5. Both P-47 pilots who experienced difficulty had seat type parachutes.

6. Three P-51 pilots had trouble with back type parachutes and one had trouble with a seat type.

HEADQUARTERS
AIR SERVICE COMMAND USSTAF
Office of the Surgeon
Records Section
APO 633

PARACHUTE JUMPS

Data reported in this paper is derived from Medical Department Records, particularly the Flight Surgeon's Report of Aircraft Accident and the Flight Surgeon's Care of Flyer and Statistical Report. The study includes all emergency parachute jumps of which the Medical Department has Records performed over the British Isles by personnel in this Theater and some additional jumps performed by combat crew members over enemy occupied territory later returned to this theater. The period analysed is from August 12, 1942, to February 15, 1944.

GENERAL

In the period reported a total of 373 individuals of the Eigth Air Force made emergency parachute jumps. Of the total, 22 or 6% were killed; 114 or 39% received injuries related to the jump and 237 or 55% were uninjured. The jumps were made from 100 feet to 27,000 feet.

ALTITUDE OF JUMPS

In most instances the altitude at which the individual left the plane was estimated by the individual himself. This figure was accepted as the true one, always realizing that personal error might be considerable in such an estimation. In those killed the estimation was made by eye witnesses. In other instances the altitude was not stated. In these cases an approximation was made based upon other information available in the individual report. The jumps reported ranged from an altitude of 100 feet to 27,000 feet with the majority leaving the aircraft between 600 and 5,000 feet. The number of jumps made at different altitude ranges is shown in Table I.

TABLE I

RANGE OF ALTITUDE FROM WHICH PARACHUTE JUMPS WERE PERFORMED

ALTITUDE RANGE	NUMBER OF JUMPS	PERCENTAGE OF TOTAL JUMPS
0 - 500 feet	15	4%
600 - 5,000 feet	262	70%
6,000 - 10,000 feet	38	10%
11,000 - 15,000 feet	23	6%
16,000 - 20,000 feet	24	7%
Over 20,000 feet	11	3%
Total	373	

Inclosure No 3

A more detailed analysis of jumps from altitudes over 20,000 feet was made in respect to loss of consciousness and other effects suffered by the individual. This information is listed as follows:

ALTITUDE	NUMBER OF JUMPS	PARTICULARS
21,000 feet	1	The individual removed his oxygen mask one minute before jumping and used no bail out bottle or walk around bottle. He opened his chute immediately upon leaving the plane. He estimated he lost consciousness for five minutes during the descent.
22,000 feet	5	All five opened their chutes at various unestimated altitudes. One individual lost consciousness but recovered before landing.
23,000 feet	1	Used no supplementary oxygen. Did not lose consciousness.
25,000 feet	1	Fell free to 5,000 feet. Did not lose consciousness.
26,000 feet	1	Opened chute immediately upon leaving plane. Lost walk around bottle due to jerk of parachute opening. Lost face mask due to windblast. Claims to have lost consciousness for a few minutes at 15,000 feet.
27,000 feet	2	Both opened chute soon after leaving the plane. One lost consciousness for a few minutes. One maintained consciousness throughout.

DEATHS FROM PARACHUTE JUMPS

In this series 22 individuals or 6% of the total attempting parachute jumps were killed. The greatest cause of death was attempting a jump from a too low an altitude where insufficient altitude was allowed for the chute to open. Ten of the 22 reported deaths were caused from leaps from lower than 500 feet. The altitudes from which jumps were made in those killed and the particulars concerning the deaths are shown in Table II.

TABLE II

DEATHS FROM PARACHUTE JUMPS-ALTITUDE JUMPED

ALTITUDE JUMPED	NUMBER OF DEATHS	PARTICULARS
Less than 500 feet	10	Chute failed to open in all cases.

TABLE II (Continued)

ALTITUDE JUMPED	NUMBER OF DEATHS	PARTICULARS
600 - 5,000 feet	9	3 chutes failed to open. 4 drowned. 1 fell out of chute - leg straps not fastened. 1 left plane at too high speed.
6,000 - 10,000 feet	2	1 drowned. 1 fell out of chute.
20,000 feet	1	1 left chute in plane.

Of the individuals who lost their life from drowning (5), 4 had failed to unbuckle their chutes before striking the water and were found still attached to their chute. One other was drowned (one of a bomber crew) because of inability to swim. It is not known whether he had a Mae West life preserver or not. In many cases, those individuals who were killed by jumping from a low altitude left others in the aircraft who successfully crash-landed without serious injuries. As a recapitulation, the causes of death occurring from parachute jumps is, as follows:

Chute failed to open	13
Drowned	5
Fell out of chute	2
Left chute in plane	1
	1

INJURIES INCURRED IN PARACHUTE JUMPS

Of the 373 individuals making parachute jumps in this theater, 114 or 39% were injured. These 114 individuals received a total of 170 injuries. As one might expect, the majority of the injuries were of the lower extremities. Sprained ankle constituted the greatest hazard with 27 injuries of this sort reported. Table III shows the main injuries received in order of their frequency. A complete analysis of injuries received are shown in the Appendix A, attached hereto.

TABLE III

TYPE OF INJURIES RECEIVED IN PARACHUTE DESCENTS

INJURY	NUMBER	PERCENT OF TOTAL INJURIES
Sprained ankle	27	15%
Sprained back	17	10%
Generalized contusions	13	7%
Fracture tibia-fibula	10	6%
Sprained knee	9	5%
Fractured Ankle	8	5%
Others	86	52%
Total	170	

For the Surgeon:

s/ Robert E. Lyons,
t/ ROBERT E. LYONS,
Lt. Colonel, Medical Corps,
Records Section.

APPENDIX A.

DETAILED LISTING OF INJURIES RECEIVED IN PARACHUTE JUMPS. (Excluding those Killed).

SPRAINS

Ankle	27
Back	17
Knee	9
Neck Muscles	5
Leg muscles	1
Sacroiliac Joint	1
Elbow	1
Thumb	1
Total	75

CONTUSIONS

Generalized	13
Head and Face	11
Leg	10
Chest	9
Sacrum	5
Groin	4
Thigh	4
Arm and shoulder	4
Scrotum	1
Total	61

GENERAL

Cerebral Concussion	2
Total	2

FRACTURES

Tibia and/or fibula	10
Ankle	8
Spine	2
Arch of foot	2
Pelvis	2
Femur	1
Ribs	1
Wrist	1
Total	27

DISLOCATIONS

Numerous (with fracture)	4
Angle	2
Cartilage of knee	1
Symphysis Pubis	1
Sacroiliac joint	1
Total	9

LACERATIONS

Scalp	5
Hand	2
Nose	1
Chin	1
Total	9

APPENDIX A.

DETAILED LISTING OF INJURIES RECEIVED IN PARACHUTE JUMPS. (Excluding those Killed). (CONT'D)

RECAPITULATION

Injuries to lower extremities	75	Sprains	62
Injuries to trunk	44	Contusions	61
Injuries to Head and Neck	25	Fractures	27
Injuries to upper extremities	13	Dislocations	9
Generalized injuries	13	Lacerations	9
TOTAL	170	TOTAL	170

OUTLINE FOR A PARACHUTE TRAINING PROGRAM

I

1. The Training Program suggested below requires no overhaul of existing instructional programs. The one word that might describe it is "intensification." The elements can be added, unobtrusively, to current programs.

a. Normal methods: Increased use of lectures with dramatic visual aids; posters; manuals; film strips; training films. More training films of the caliber of TF 1-3665, "Parachuting Into Water", are needed. Many current films and film strips are obsolete.

b. Special methods:

(1) Demonstrations (by Parachute Department personnel)

(2) Familiarization drills with commonly supplied parachutes. (Compare intensity of training program for Defense Against Chemical Warfare.)

(3) Practice drills in bail-out exit procedures of training and operational aircraft or mock-ups.

(4) Augmentation of the Physical Training Program and Functional Swimming Training Program.

2. Elements of the Parachute Training Program can be added to the current instructional programs:

a. Cadet Program: parachute indoctrination and familiarization.

b. Physical Training Program — all phases.

(1) Emphasis on tumbling; the body attitude in ground touchdown parachute landing. Sand or sawdust filled pits and a jumping platform are required outdoors; regular tumbling mats of a normally equipped gymnasium are required indoors. (See photograph of training at Parachute School, Fort Benning, Georgia).

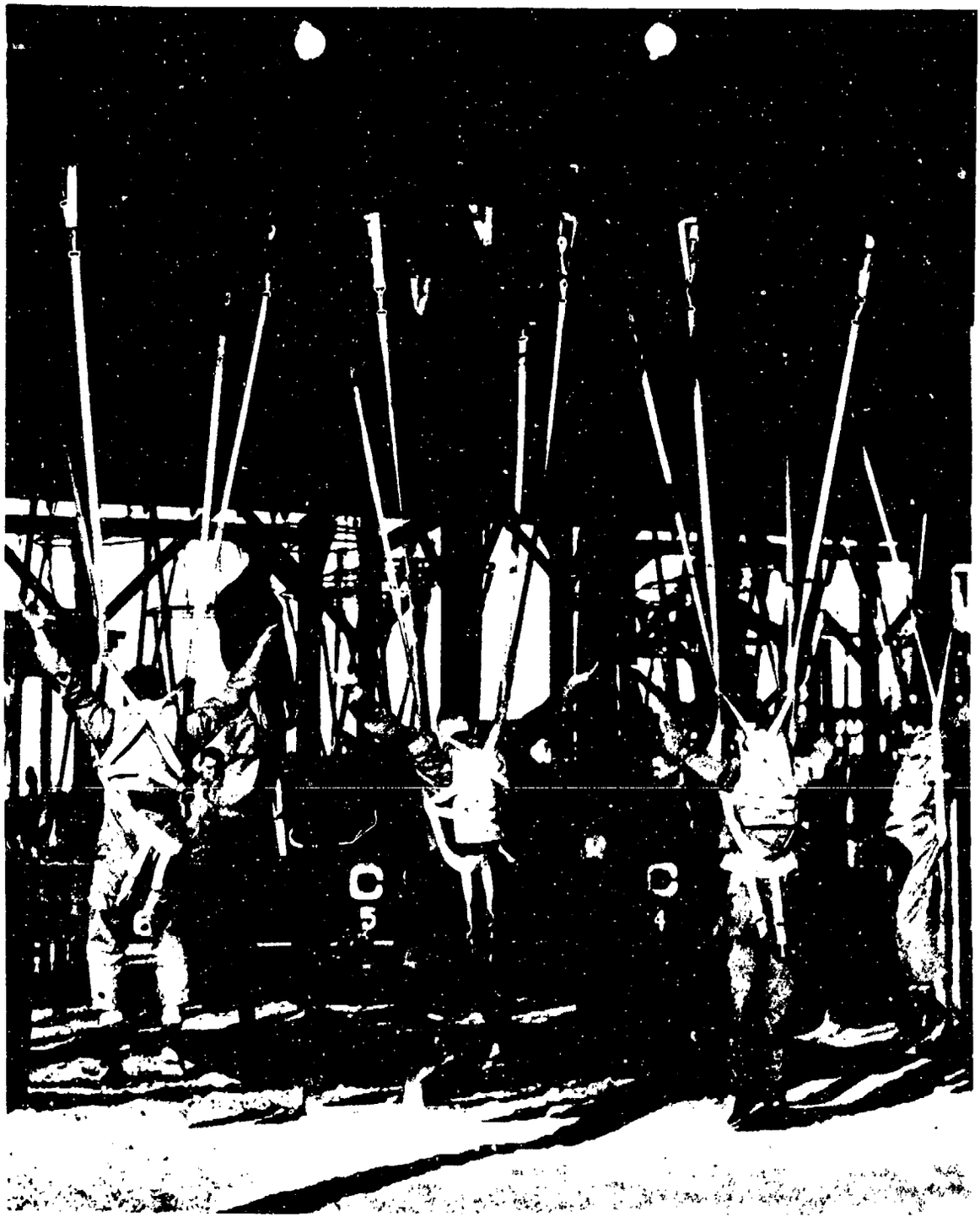
(2) For landing in water, parachute harness platform can be rigged over indoor or outdoor pools and lakes.

c. OTU Programs — all phases. Chute indoctrination and training can be added to non-operational (weathered-in) day training, especially in first phase.

d. Assignment Pool refresher course training.

e. Survival Training Program emphasizing parachute improvisations. (ADITIC)

f. Combat Theater Training Program.



Inclosure No: 4
Page No: 3

UNCLASSIFIED

HEADQUARTERS ARMY AIR FORCES
Washington 4 March 1944

AAF REGULATION
No. 55-7
55-7A

OPERATIONS
Personal Equipment Officer

2. DUTIES. It will be the primary duty of the Personal Equipment Officer to supervise the maintenance of, and to instruct in the proper use of, emergency equipment, individual flying equipment, oxygen equipment, air-sea rescue equipment and other related items. In addition, he will be responsible for the coordination of air-sea rescue activities. The Personal Equipment Officer will be a non-flying officer. Only in exceptional circumstances will additional duties, other than those prescribed, be assigned to a Personal Equipment Officer. Detailed duties are outlined below:

a. Squadron and Group Personal Equipment Officers will carry out the following duties with regard to:

(2) Individual Flying Equipment:

(a) Supervise thorough and periodic drill of all flying personnel and parachute maintenance personnel in the proper care, maintenance, and use of parachutes.

(b) Insure that parachutes are periodically and properly inspected and that adequate records of such inspections are kept by the Engineering Section.

(c) Insure that all flying personnel are trained in the use of various types of flying clothing, including life vests, and in the proper care and maintenance thereof.

(e) Conduct drills for all personnel to familiarize them with the location of escape hatches and proper escape hatch technique. Insure that all crew members know the location of escape hatches, the methods of opening them, and which one is assigned to each man.

(f) Inspect and supervise the maintenance of escape hatches by the Engineering Section.

Inclosure 5

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[redacted]

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ARMY AIR FORCES BOARD
Orlando, Florida

17 March 1945.

PROJECT DISTRIBUTION LIST

ARMY AIR FORCES BOARD PROJECT NO. 4225A373.1

PARACHUTE QUESTIONNAIRE PROJECT

AAF Board Control Office	12	AAF Board Files	5
Field Testing Agency Concerned	1	Members of AAF Board (3)	1
Central Library AAFSAT	1	CG, AAFPGC (Proof Dept.)	2
Director ATSC Area-A	4	Director ATSC Area-B	4
RAF	4	Hq., AAF Library	2
AAF Board Liaison Officers (4)	5	AAF Board Liaison Officer ETO	8
Ea. Continental Air Force (4)	5	Ea. Continental Fighter Command	4
Ea. Continental Bombardment Command	4	Ea. Continental Bombardment (VH) Command	4
Ea. Continental Tactical Air Command	4	Ea. Continental Troop Carrier Command	4
Ea. Continental Training Command	4	Ea. Continental Fighter Wing	3
Ea. Continental Bombardment Wing	3	Ea. Continental Bombardment (VH) Wing	3
Ea. Continental Troop Carrier Wing	3	Ea. Continental Weather Wing	3
Ea. Continental Photo Recon Wing	3	Chief, Training Aids Division	2
B-29 Crew Training, AAFTS	1	Dir. Combat Oper Dept, AAFSAT	1
		Hdq., USSTAF E.T.O.	10

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DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR MOBILITY COMMAND (AMC)

29 MAY 1998

MEMORANDUM FOR DTIC-RSM
8725 John H. Kingman Road, Station 0944
Fort Belvoir VA 22060-6218

FROM: HQ AMC/SCYN[FOIA]
402 Scott Drive Room 132
Scott AFB IL 62225-5363

SUBJECT: Distribution Limitation on DTIC Documents (FOIA Request – Mr. Ian Sullivan)

1. On 27 March 1998, Ms. Kelly Akers from your office forwarded 10 documents to 11 CS/SCSR, Washington DC as responsive documents to a FOIA request from Mr. Ian Sullivan. Air Force was considered to be the controlling activity to determine releasability of the documents. Ms. Akers requested notification if the Air Force determined the distribution statements should be changed.

2. Five of the documents were sent to Headquarters Air Mobility Command, Scott AFB IL for release determination. Upon review, we determined documents listed below are releasable to the requester and the restricted distribution statement can be removed.

ATI 075959	Suitability of the B-24 Type Aircraft for Troop Carrier Operations
ATI 076730	Suitability of the B-17 Airplane for Troop Carrier Operations
ATI 087724	Tactical Doctrine of Troop Carrier Aviation
B972097 ✓	Operational and Tactical Suitability of the c-46A Airplane for Troop Carrier Operations – AAF Board Project No. (M-1) 105
B972518 ✓	Parachute Questionnaire Project

3. Direct any questions to Ms. Glenda Allen at DSN 576-4975 or 618-256-4975.

DOUGLAS R. WALTON, GS-12
Chief, Records Management
Directorate of Communications & Information

Per my telecon with Glenda Allen on 8 Jun 98, the documents can be marked "available to the public." It wasn't real clear in ~~her~~ letter.

Kelly Akers
DTIC-RSM
8 Jun 98